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McGRAW-HILL BOOK NOTES

FEBRUARY, 1926

Special Features

Do We Need Better Engineering Education?

By William E. Wickenden

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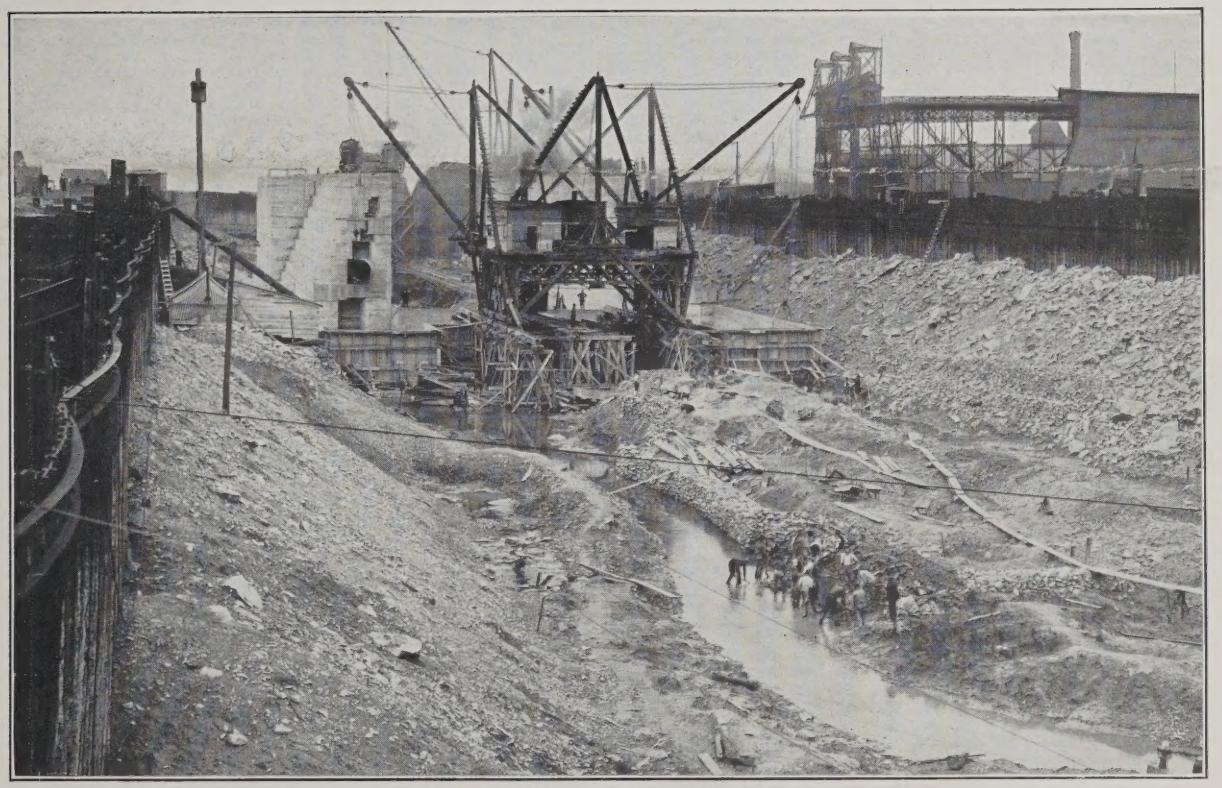
Pictures of New College Buildings

(Pages 8–9)



Cofferdam at Black Rock Harbor. From Jacoby and Davis's *Foundations of Bridges and Buildings.*

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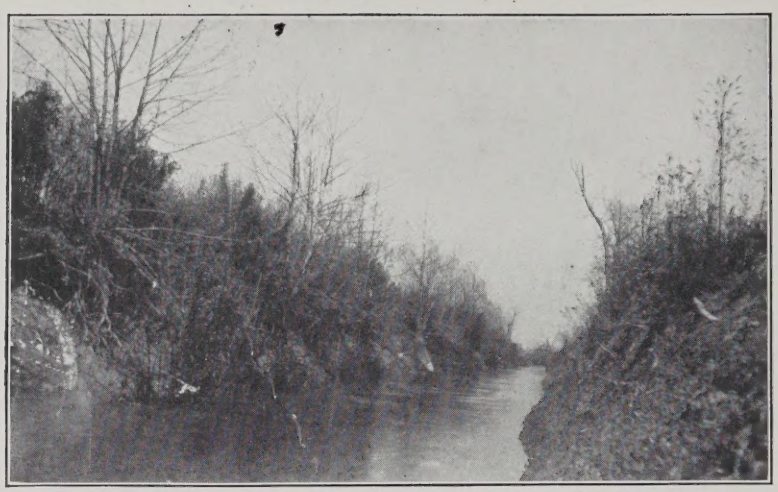

View of channel of Old Town Creek, near Tupelo, Miss., before clearing.
From Pickels' *Drainage and Flood-Control Engineering.*

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McGraw-Hill Book Notes

FEBRUARY, 1926

Do We Need Better Engineering Education?

By William E. Wickenden

Director of Investigation

Society for the Promotion of Engineering Education

Our economic order is based on the utilization of the stores of matter and energy in nature for the service and convenience of mankind, and on the organization of human effort for this purpose. By widely accepted definition, this is the task of engineering. It is a task which grows constantly more difficult. A mere glance at current trends in American life may suffice to indicate the fast increasing burdens being laid upon the engineer.

It seems apparent that for some decades to come the growth of our population will be almost wholly in urban centers. This urban trend brings with it crowding of population, complex living, narrowed margins of human accommodation, and absolute dependence on the technical services of fuel, power, light, and water supply, of transportation, communication and sanitation. The city has become the great field of the engineer's work, increasing its intricacy and vastly adding to the concern of engineering with strictly human problems. The only possible answer to the problem of the future big city is better engineers.

Now that we are well advanced in the movement to large-scale organization and regional specialization of industry, we are entering on an equally significant program of concentration and interconnection of power supply. The technical problems of vast-scale industry can not be solved by men who are ignorant of the related social and economic problems, nor can the executive problems of coordination be solved by men ignorant of the underlying technical processes. The stimulus of war and the accumulation of capital have led to a fairly world-wide tendency to over-build producing machinery. Of all the occidental nations, Russia alone appears to be wrestling with the problem of sufficient production. The rest of us are all seeking markets. Through this shift of emphasis from production to distribution, world distribution if you will, the engineer is drawn into realms which demand the widest economic understanding. The insistent demand of industry is for engineers who are better qualified to reconcile the solution of technical problems with large-scale social and economic situations.

The visible shrinkage of our natural resources touches the engineer's job in a vital way. Engineering was one thing when oil spouted from gushers and a little gasoline per barrel was all the market would bear. It is quite another when oil comes from lean pump wells and the market demands the last drop of gas out of every barrel. And it will be still something else when we are driven to the shale rocks. There are just two answers to this problem—conservation and better engineers.

WILLIAM E. WICKENDEN

Is there anything fundamentally wrong with engineering education today? How are the engineering colleges meeting the strain of the modern expansion of knowledge? Is engineering education going through the "growing-pains" stage? Is there an over-supply of engineering graduates today? What can the engineering colleges do to meet the demands made upon them?

These are some of the questions Mr. Wickenden's sound and stimulating article discusses.

There is the decline of sporadic invention to be reckoned with, and equally significant, the narrowing margin between invention and the advancement of scientific knowledge. There is no reason in genetics for assuming that the pioneering strain in our blood which produced Franklin, Fulton, Whitney, Morse, Howe, Ericsson, Westinghouse, Edison, Bell, Selden, Eastman or the Wright brothers has run out, but we shall have to seek their successors more in the research laboratory and less in the garret or workshop. Engineering must be able to assimilate the physicist, the chemist, the biologist, the geologist, the psychologist and the mathematician, all of which means better engineers.

The national economic policy, based on a protective tariff, restricted immigration and a limited birth rate, is highly significant for American engineering. While the population of Europe and Asia crowds dangerously against the limits of natural resources, we have undertaken to keep to ourselves the fruits of our unmatched resources by a deliberate policy designed to keep men scarce. Over-population abroad fixes a level of international competition from which there is no escape, while scarcity of man-power at home drives us to the maximum utilization of power and machinery to maintain our national economic position and traditional standard of living.

The Strain on Engineering Colleges

It seems clear that engineering education has not wholly met the strain imposed on it by these swift and irresistible changes in the economic world. It has felt no less the strain of the four-fold expansion of our higher education and the eight or ten-fold expansion of our secondary education since the beginning of the century. Some would say that the word *expansion* is misleading and substitute *dilution* in its place. This growth has put the colleges under an immense financial strain, aggravated by the present necessity of doing business with sixty-cent dollars. Fortunately for the engineering colleges, their share in this growth came early in the twenty-five year period referred to and largely antedated the major changes in money values.

While the material state of these colleges is relatively satisfactory, they have not escaped in equal measure the strain on their teaching personnel, the recruitment of which has had to be done in the period of the greatest competition for college-educated brains ever experienced.

Nor have the engineering colleges been unaffected by the strain of recent years on student morale. The shift of emphasis in secondary education, away from intellectual training and toward civic training, has multiplied the problems of the engineering colleges, which have perhaps less margin for adjustment to changing levels of secondary education than any other group of undergraduate colleges. In all circles of the population, youth and adult alike, there has been evident an outreach after leisure, a seeking after the easiest way, and a quest for immediate financial returns. The fifty-hour week of the engineering college lacks the lure of the thirty-hour week now so common in academic circles; the tradition of an arduous apprenticeship after college has to meet the propaganda which alleges that other and less tried educational programs lead to quicker and more brilliant success; and the modest, but fairly certain and long-sustained, growth of financial reward in the technical callings has to meet the competition of salesmanship and other roads to quick returns.

Engineering education has felt, and felt severely, the strain of the unprecedented expansion of knowledge. The curriculum has been under constant pressure from this source. Every subject has been subjected to a relentless test of its relevancy and its teachability. One who compares engineering curricula with others of different types is struck with the unusual coherence of the former. Even the most merciless critics of engineering education admit that there is no dubious matter in the curricula. Perhaps they err in the opposite direction.

It is not to be wondered that the structure of engineering education has not wholly withstood these complex strains. It is a structure based on notable pioneering of sixty years and more ago which has grown by evolution, imitation and the uncritical acceptance of conventional models to its present state of quasi-standardization.

The Growing Pains of Engineering Education

The symptoms by which these are revealed are various. For years there has been a vague unrest among engineering teachers, which led up to the earlier investigation of engineering education by Dr. Charles R. Mann under the auspices of the Carnegie Foundation for the Advancement of Teaching and more recently to the inception of the present project of the Society for the Promotion of Engineering Education. Of late there has been a growing solicitude on the part of the national engineering societies, as these bodies have come to recognize in the colleges the major source of recruitment of the engineering profession. There has long been a stream of criticism from the industries, first that engineering education was not practical enough and more recently that it is not broad enough. Alumni organizations are increasingly active, both in criticism and constructive action.

At the risk of changing the figure, may I venture the opinion that these symptoms do not indicate a fundamentally diseased state—they are the growing pains of engineering education, of the engineering profession and of American industry. Solicitude and criticism have their encouraging aspect, evidently somebody cares. It is daily becoming clearer that the engineering colleges are outgrowing their isolated position as scattered units in an educational system and are being taken into a working partnership by the professional and industrial organizations of the engineering world. These new demands and relationships, which mark the beginning of far more intimate participation of the engineering colleges in the economic order of society, have called for a critical re-examination and re-evaluation of our whole plan of higher technical education.

Re-evaluation

The first step in this process has been to get at the facts, then interpret them. Reduced to their most elemental terms, a few of these facts follow. The engineering professions are now drawing about two thirds of their recruits from the graduates of the engineering colleges. These colleges in turn draw four fifths of their students from the public high schools and only one in eight by transfer from other colleges. Engineering students are drawn from the better scholastic groups, 60 per cent coming from the upper third and 37 per cent from the middle third of their high school classes. They have substantial but not distinguished social, cultural and economic backgrounds, with a percentage of native parentage and grandparentage decidedly above the population as a whole. The grounds on which they choose engineering as a vocation or an educational program appear to be inadequate, with little aid from reliable information and little intelligent counsel. These choices are made at an early period, fully 77 per cent before graduation from high school.

The high mortality among engineering students is a source of concern, as 62 per cent of those admitted fail to complete their courses. The mortality among those admitted with conditions is still higher. Most of the elimination comes in the first two years without an adequate try-out in engineering subjects as such. The elimination ratio has shown a tendency to increase during the recent period of great expansion of secondary education. Half the failures are ascribed by engineering teachers to lack of ability, interest or preparation.

No Over-supply of Graduates

There is no indication of an over-supply of graduates. Only one fifth have occasion to seek positions through their own efforts, or through agencies or advertisement. Starting salaries of today are on a par with those of fifteen years ago, allowing for changes in the value of a dollar. The industrial surveys indicate that large sections of industry are still under-recruited. Graduates do not drift out of the engineering field to an alarming extent. Two thirds remain in the field of engineering for which they were trained in college or in a closely allied field. Only one sixth consider that they have definitely left the engineering fold.

There is a steady trend among graduates during their first fifteen years of experience toward administrative duties. Of the three most recent classes 71 per cent are engaged in work primarily technical, while classes out fifteen years and more show 70 per cent in work primarily administrative. Graduates have a steadily rising earning power with experience, the median being approximately $3,000 after five years, $5,100 after fifteen years and $7,500 after thirty years.

The inbreeding of engineering teachers and the losses to practice are less than often supposed. About a fifth of the appointments are made by promotion and an equal number by transfer from other teaching staffs. 28 per cent of the appointments are made from practice. Aside from death and retirement, the losses from teaching to practice are about 7 per cent per annum and the total turnover about 10 per cent. The median academic salaries of engineering teachers during the first thirty years after graduation agree quite closely with the upper boundary of earnings of the lowest 10 per cent of the graduates, while the median of the teachers' incomes from all normal sources agrees approximately with the boundary line of the lowest 35 per cent of the graduates.

Recommendations

The large groups of graduates, active engineers and industrialists which have been canvassed have given a significant appraisal of the merits and defects of engineering education. As a means of developing accuracy and thoroughness the rating has been very high; as to the cultivation of diligence, integrity, reliability, initiative and originality it has been uniformly moderately high; while as to the qualities of leadership it has been moderately low. The technical and scientific

(*Continued on page 13*)

North River water front—New York. From Droege's *Freight Terminals and Trains.*

A Notable Review of a Notable Book

Says Railway Age in a review in a recent issue:—

"Droege's *Freight Terminals and Trains*, immediately it was written in 1912, became the authority on its subject, and has so remained to this day. No one would imagine preparing a bibliography on railway operation without giving this volume a chief position in the list. The book secured its position of pre-eminence because of its peculiarly skilful combination of engineering and operation information; and because of its all inclusiveness. In addition to these, there was an interesting vein of comment born of the author's varied experiences as an operating officer on a busy railroad. In revising the volume for its second edition, Mr. Droege had to keep in mind at all times the responsibility which he owed to readers who were familiar with the excellent character of the former work. Mr. Droege has fully met this responsibility. His new volume is by no means a mere reprinting. Its accuracy is notable; if anything, it is in this respect better than was the earlier edition. It is up-to-date, the old data that served its purposes in 1912 having been very generally replaced by more recent information made available in 13 busy railroad years. Most important of all, one finds due recognition of the modern developments of railroading among which may be instanced the use of the motor-truck in co-ordination with rail transport, the use of what the Baltimore & Ohio designates as its maintrackers, the peg system utilized on the Buffalo, Rochester & Pittsburgh, etc. One notices comment on the railways' failure to secure greater utilization of their motive power.

"The subjects considered include the design and operation of yards and the work of the yardmaster; management and discipline; the make up and movement of trains; time freight service; records and statistics; the design and operation of freight stations; transfers; mechanical handling of freight; and the design and operation of the locomotive terminal. There are valuable chapters on special facilities such as ore docks, coal piers, and water-front terminals; and of particular interest is the chapter on British freight service. One notes especially the importance given to data of operating costs, and the care taken to make this data up to date so as to be usable with the after-the-war decline in the value of the dollar.

"The railway world can congratulate itself that this valuable work has now been brought up to date. It is a book that no one desiring to make a thorough study of railway operation can afford to do without."

The New Jacoby and Davis

Jacoby and Davis's *Foundations of Bridges and Buildings* is now available in a new, thoroughly revised second edition.

The book covers the theory and practice of engineering foundations as applied to bridges and buildings. The changes in professional practice have been carefully studied and their significant features incorporated in this treatment. The book in its new form is representative of the best foundation engineering practice of today.

It covers all types of piles and pile driving, cofferdams, box and open caissons, pneumatic caissons, ordinary cylinder and pivot piers, bridge abutments, spread foundations, underpinning, etc., etc.

New material in the second edition includes:—

—new treatment of marine borers and mechanical protection;
—new types of piles;
—pulling sheet piles;
—use of followers;
—new formulas for bearing power;
—new types of cofferdams and caissons;
—new standard designs of piers and abutments;
—material on timber piers.

Drainage

A new text that covers all phases of drainage engineering from the drainage of small areas of farm land to the reclamation of large areas is Pickels' *Drainage and Flood-Control Engineering.* It discusses also the economic and legal phases of drainage projects.

The text explains the principles that control the selection of a comprehensive drainage system as well as the principles which govern the design of the details.

The marked advances made in drainage practice in recent years are emphasized and special attention is given to the contributions which the sciences of hydrology, hydraulics and soil physics have made to drainage and flood-control engineering.

Short Items

Coming soon—a new third edition of Fortier's *Use of Water in Irrigation.*

* * * * *

Some of the colleges that have already adopted Barton and Doane's *Sampling and Testing of Highway Materials* are:—

Iowa State College
University of Louisiana
University of Michigan
University of Pennsylvania
South Dakota State College
Texas A. and M. College
Pennsylvania Military College

* * *

The new third edition of Daugherty's *Hydraulics* is being studied by more students this year than in any other year in the book's history.

JOHN A. DROEGE
General Manager, New York, New Haven and Hartford R. R. Co.

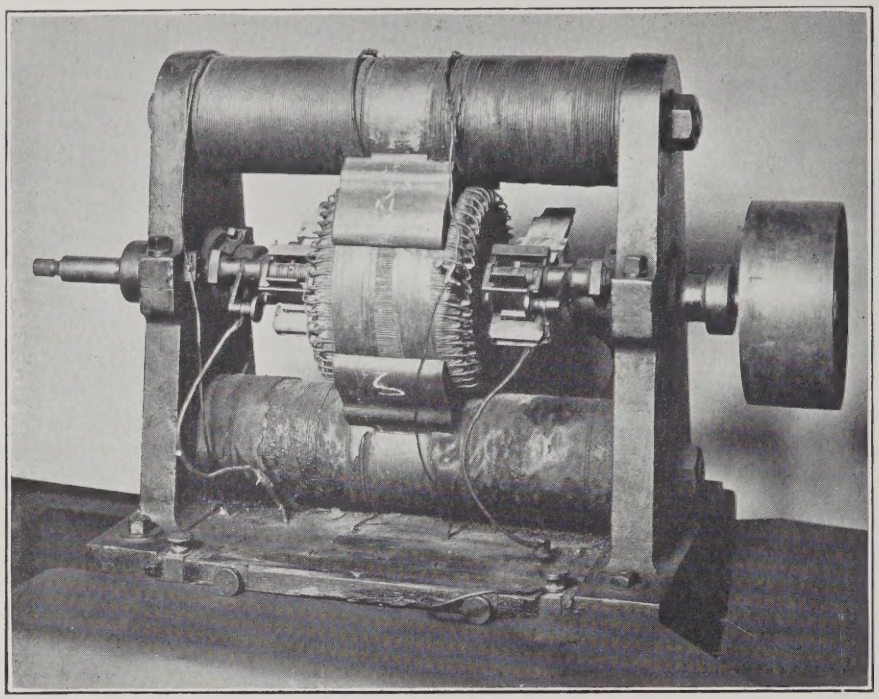
A.-C. Circuits and Transmission Lines

Professors Bryant and Correll say in the Preface to their *Alternating-Current Circuits*:—

"In the first six chapters the theory of alternating-current circuits is discussed and the equations applying to the various types of circuits are developed from the fundamental physical and mathematical principles in the same manner in which they have been developed in lectures before the classes. In the remaining chapters these principles have been applied to polyphase circuits and transmission lines. Free use has been made of the vector diagram and of the mathematics of a vector in a plane as developed by Dr. Steinmetz and others.

"This text is not intended to be a complete treatise on transmission lines, but rather the transmission line has been introduced as a practical illustration of a type of complex circuit. Numerous numerical examples have been given to illustrate the application of the equations and also the engineering methods of attacking problems involving intricate equations."

The book offers an interesting course for the junior year.



The first dynamo made in America. This dynamo was built in Cornell University shops by Cornell students in 1875. Picture through courtesy of the Cornellian Council Bulletin.

Superpower

What it is.
Its economic and social aspects.
What it comprises for the industrial welfare of the nation.
What has been done in this field.
What is being done today.
What remains to be done.
How the work can best be pushed forward.

These are some of the topics discussed in William Spencer Murray's *Superpower—Its Genesis and Future*, which we have just published.

The book covers the economic, engineering and social aspects of superpower.

Changes in the Third Harding

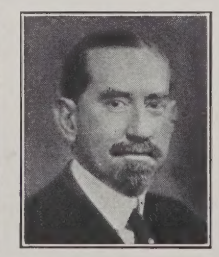
A new third edition of *Electric Railway Engineering* by Professor C. Francis Harding of Purdue University is ready.

The important changes in this revision include:—

—a new chapter on the economic problems involved in motor-bus transportation;
—a chapter on Sources of Electrical Energy, containing in detail one of the most recent and complete contracts for electrical energy ever negotiated;
—revisions and new material in all of the chapters involving applications and engineering practice;
—the results of new research and new developments are thoroughly described.

Experimentation in Textbooks

Here is an excerpt from an editorial in the November issue of the Peabody Journal of Education:—



Left—J. M. BRYANT, Professor of Electrical Engineering, University of Texas. Center—J. A. CORRELL, Associate Professor of Electrical Engineering, University of Texas. Right—W. S. MURRAY, of Murray and Flood, Engineers.

"Schoolbook publishers are, as a group, very progressive, not conservative. The companies differ, of course; there are a few "standpatters" and perhaps a few radicals. The greater part of the business is done by firms who in their production of the textual materials for teaching are, in educational vision, well in advance of the majority of teachers and school executives. Education is progressing rapidly. Textbook publishers must, from sane business prudence, aim ahead—at the market of the near future, not that of the recent past. The result is much experimental production. Almost every publisher puts forth not a few books which eventually prove to be financially unprofitable. Sometimes such ventures are quite deliberate—one might say, altruistic. More often they are an essay put forth hopefully.

"The value to the school world of this tremendous vitality in textbook publishers is incalculable. No thoughtful teacher would curtail it or stifle it. The financial cost of experimental striving must, of course, become an increment to the price of books which prove salable, but it is a farthing to be paid ungrudgingly."

Brief But Important

Coming soon—Bennett and Crothers' *Introductory Electrodynamics for Engineers.*

* * * * *

For vocational schools we recommend Dawes' *Industrial Electricity—Parts 1 and 2.* Part 2 has just been published.

* * * * *

Nash's *Economics of Public Utilities*, published September 11, 1925, is already in its third printing.

* * * *

Pertsch's *Electrical Engineering Problems — Part 1* presents 824 problems on the fundamental relations in electric and magnetic circuits and their application to direct-current machinery. Some of the colleges that have already adopted this new problem book are:

Armour Institute of Technology
Cornell University
Northeastern University

The Bookworm's Own Column

Experienced authors will appreciate this excerpt from the "Author's Soliloquy" in William Spencer Murray's *Superpower: Its Genesis and Future*:—

"To present a subject orally to an audience requires only physical courage, a good subject, and a convincing manner.

"To consent to be the author of a book involving both engineering and economic problems requires moral courage, together with an intimate knowledge of the subject and an ability to present the facts logically and understandingly..."

* * * * *

Perhaps you don't fully believe in the thrilling character of the material in technical books. Just as an antidote to your doubt, read the section on Precious Stones in the current volume of *Mineral Industry, Volume XXXIII.* Read, for instance, how the diamonds of the Belgian Congo, amounting to 250,000 carats a year, will be sent from the interior to the coast by airplanes in two days whereas formerly the trip by water—arduous and dangerous—took about forty days. Read on page 605 how the diamond cutters of Amsterdam are emigrating to Antwerp and seriously disturbing the equanimity of the good burghers of Amsterdam. Read about the emerald poachers of the Ural district in Russia. Consider a paragraph like this:

"It is reported that a new ruby mine has been discovered in the Mogok district, and a miniature 'Klondyke' rush has started for the place. Many people have returned with nothing but malaria, and no information is yet forthcoming as to the value of the alleged discovery."

Thrilling? Why novels have been written on much slighter themes.

* * * * *

Here is a dramatically expressed conception from Eucken, Jette and LaMer's *Fundamentals of Physical Chemistry*:—

"....the atoms are planet systems of very small orbits, in which the sun is replaced by the nucleus and the planets by the electrons."

* * * * *

The first record of underdrainage work in this country, says Pickels' *Drainage and Flood-Control Engineering*, "was in 1835 when John Johnson of Geneva, New York, started underdrainage on his farm."

* * * * *

Professors Haslam and Russell in their new book, *Fuels and Their Combustion*, say that the avoidable wastes in fuel use are appalling. How important this is to us all may be gathered from the fact that "power, in universal use in factories, represents one of the four largest items of cost in almost every manufacturing enterprise and in some cases amounts to from 50 to 60 per cent of the total."

Civil Aviation

A book that we believe will have far-reaching influence, that will one day be termed a milestone of progress, is *Civil Aviation*—a report of the joint Committee on Civil Aviation of the U. S. Department of Commerce and the American Engineering Council.

It is a definitely constructive study providing a comprehensive and reliable review of the accomplishments and problems of civil aviation throughout the world. The book presents a survey of the economic possibilities of civil aviation in this country with a view of supplying information for legislation in this field and for analysis of operation and for guidance in sound investment.

Other reports sponsored by Secretary Hoover which we have published are *Waste in Industry, Business Cycles and Unemployment* and *Seasonal Operation in the Construction Industries.*

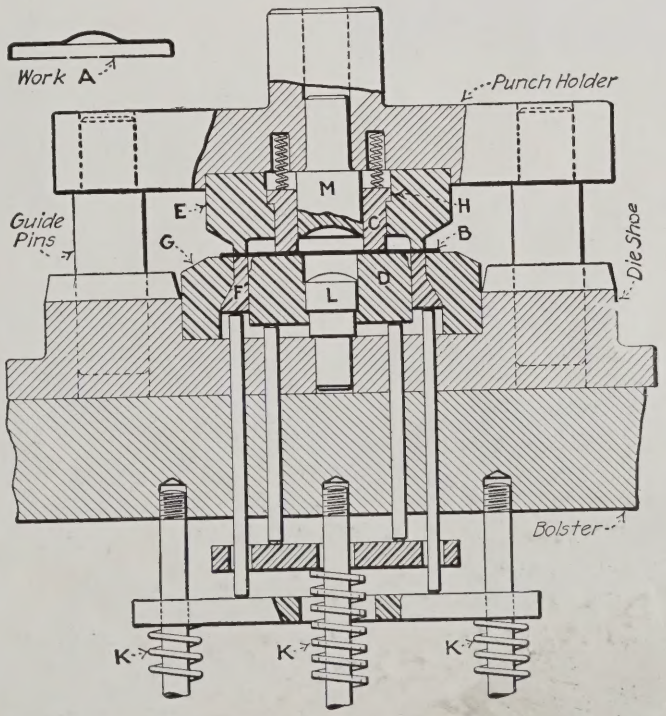
Tool Engineering

The third volume in the series on *Tool Engineering* by Dowd and Curtis is now ready —*Tool Engineering—Punches, Dies and Gages.*

This third volume takes up dies, both forging and punching press; the design of gages for interchangeable manufacture; the limit system; modern drafting room practice; elementary pattern work; feeds, speeds and cutting lubricants. Over 150 pages are devoted to die design. Fundamental principles are emphasized and applications are shown to many specific examples of dies and gages now in use in some of the leading manufacturing plants of the country.

The other volumes in the Dowd and Curtis series are:—

Tool Engineering—Jigs and Fixtures
Tool Engineering—Fixtures for Turning, Boring and Grinding



Combined blanking and drawing die. From Dowd and Curtis's *Tool Engineering—Punches, Dies and Gages.*

Here and There

Just Published—Osborne's *Power Plant Lubrication*, presenting the principles of lubrication as applied to the particular requirements of power plant machinery.

* * * * *

Have you read the chapter on Combustion and Fuel Economy, in the new second edition of Wood's *Principles of Locomotive Operation*?

* * * * *

Marks' *Mechanical Engineers' Handbook* has reached a total issue of 85,000 copies.

* * * * *

For an elementary survey course we recommend Potter and Calderwood's *Elements of Steam and Gas Power Engineering.*

* * * * *

The new material in the third edition of Allen and Bursley's *Heat Engines* has occasioned much favorable comment.

* * * * *

Perhaps one of the most interesting features of Morrison's *Diesel Engines* is the treatment of the economic status of the Diesel engine.

* * * * *

Our latest automobile book is Consoliver's *Automotive Electricity.*

* * * * *

For courses in heat engine design, please keep in mind Ninde's *Design and Construction of Heat Engines.*

The Fuel Situation

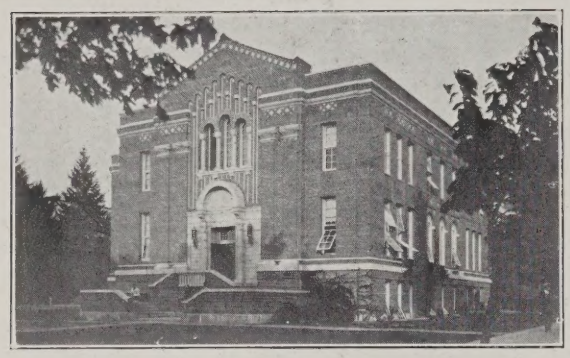
The present fuel situation is directing attention to such books as

Haslam and Russell's *Fuels and Their Combustion*

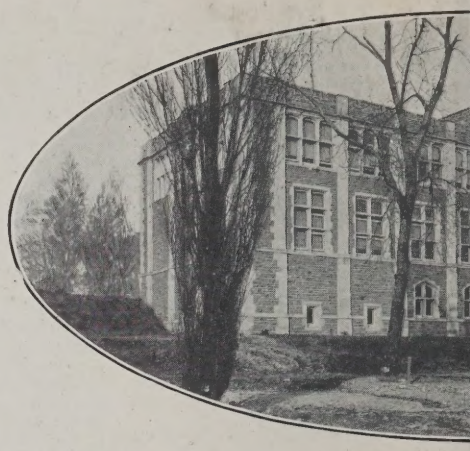
Maujer and Bromley's *Fuel Economy in Boiler Rooms*

Bacon and Hamor's *American Fuels*

Worker and Peebles' *Mechanical Stokers*



Oregon Building, University of Oregon
Eugene, Oregon
Photo by Kennell-Ellis, Eugene, Oregon

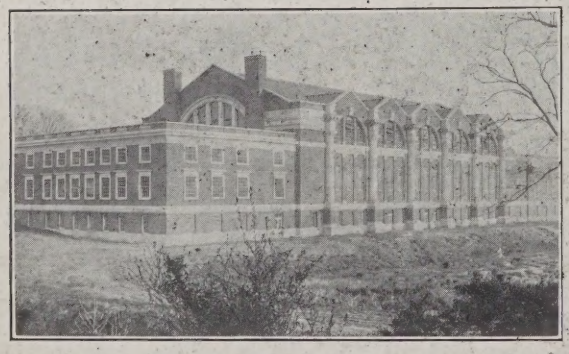


Newton R. Wilson Memori
St. L

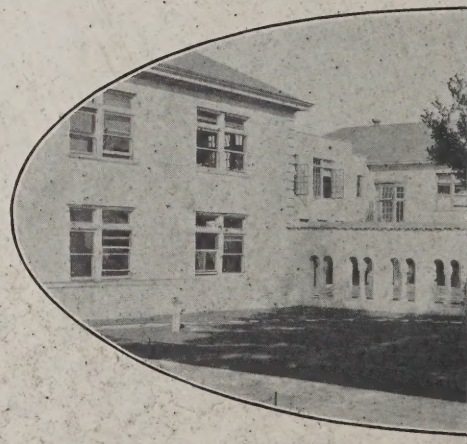
Some Recent C

Agricultural Building, University of Wyoming
Laramie, Wyoming

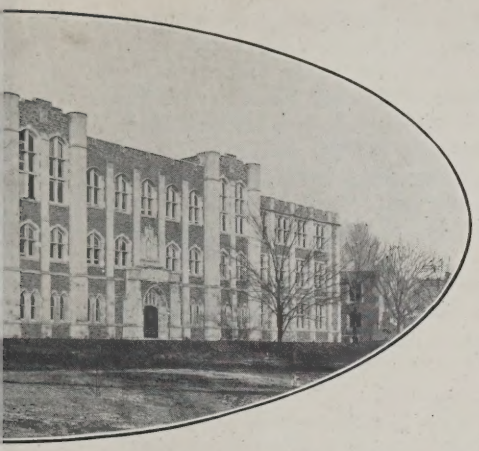
Power Plant
Washington
University
St. Louis, Mo.



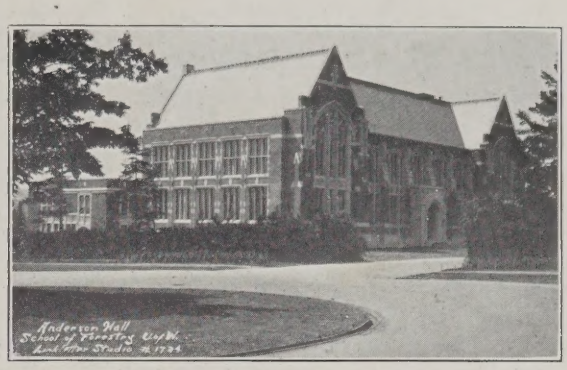
Memorial Gymnasium
University of Virginia
Charlottesville, Va.



Art and Architecture Build
Euge

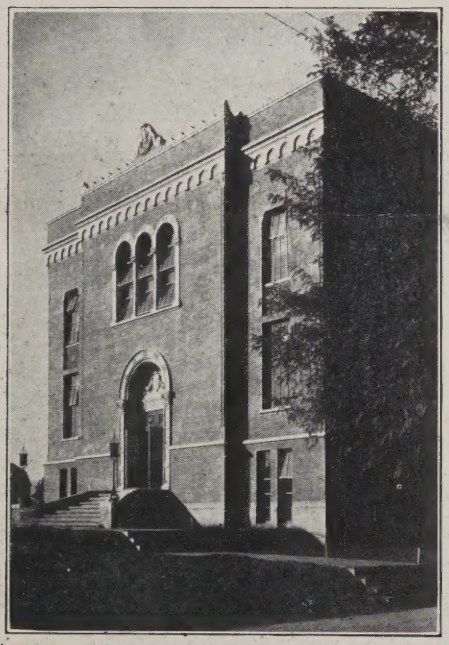


Hall, Washington University
s, Mo.

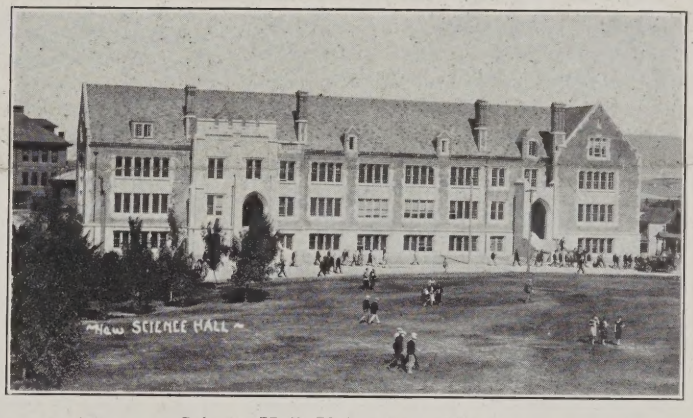


Anderson Hall, School of Forestry
University of Washington
Seattle, Wash.

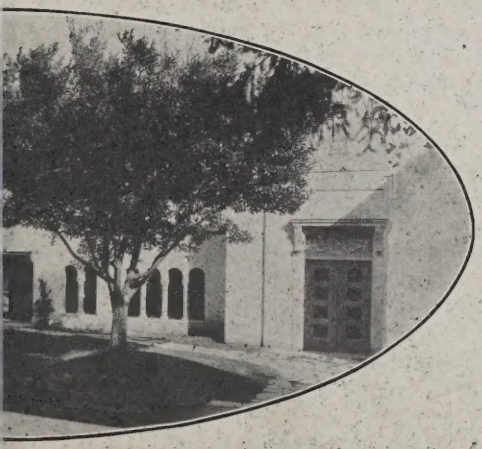
llege Buildings



Science Hall
University of Oregon
Eugene, Oregon
Photo by Kennell-
Ellis, Eugene, Oregon

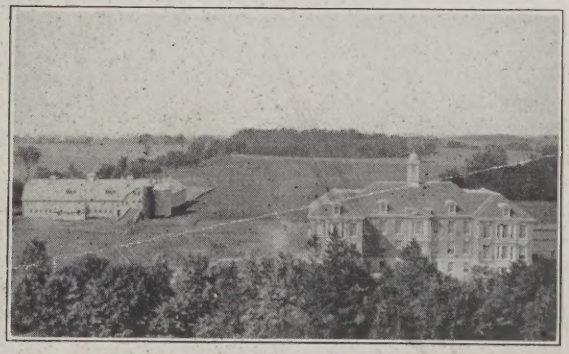


Science Hall, University of Idaho
Moscow, Idaho



Court, University of Oregon
Oregon

Dairy Building
Ontario Agricultural
College
Guelph, Canada



McGraw-Hill Authors Make The Front Page

Making the front page of a newspaper without transgressing the moral code is not an easy thing to do these days. Yet several McGraw-Hill authors have achieved this distinction lately.

For instance we noticed in the New York Herald Tribune of November 24, 1925 the following story:—

"Makes Bloodhound," Gets $800,000 Radium

"Makes 'Bloodhound,' Gets $800,000 Radium.

"St. Paul, Minn., Nov. 23 (A. P.).—Six weeks patient search with a 'mechanical bloodhound' has resulted in the finding in a sewer pipe of a tiny tube containing radium valued at $800,000 which disappeared from a hospital here. Professor Henry A. Erikson, head of the physics department, University of Minnesota, constructed ionization chamber detectors, which were attached to electroscopes, and began to hunt along sewers leading from the hospital. To-day the detectors led him to a nine-inch pipe in a sewer tunnel. The radium tube was found within two inches of a mark he made on the pipe."

Professor Erikson is co-author of Zeleny and Erikson's *Manual of Physical Measurements.*

Another story we noticed in the same newspaper two days later runs as follows:—

"New Alum Rock Mineral"

"Palto Alto, Cal., Nov. 25 (A. P.).—Professor A. F. Rogers, of the Department of Mineralogy of Stanford University, to-day announced the discovery of a mineral in alum rock, a famous deposit at San Jose, that has never before been entered in the mineralogical annals of the world. He has called this discovery 'Kempite' in honor of Professor James F. Kemp, of Columbia University, New York. The new mineral is a manganese oxy-chloride and has no commercial value."

Professors Rogers and Kemp are both McGraw-Hill authors, by reason of Rogers' *Introduction to the Study of Minerals* and Kemp's *Ore Deposits of the United States and Canada.*

The New York World lately ran a half-column interview with General Amos A. Fries (co-author of Fries and West's *Chemical Warfare*) in which General Fries called attention to the importance of chemical warfare as part of our national defense.

Of course the McGraw-Hill author who gets more newspaper space than all other American technical authors together is a certain Mr. Herbert C. Hoover. Now that his range of activities is so greatly extended, it must not be forgotten that he is the author of Hoover's *Principles of Mining.*

Lakeview No. 2 gusher, Sunset Field, California. From Uren's *Petroleum Production Engineering.*

Adoption Report on Richards and Locke

The new second edition of Richards and Locke's *Textbook of Ore Dressing* was published in July of 1925. Up to January 1, 1926 the following schools had adopted the revision of this standard text:—

Alaska Agricultural College
University of Alabama
University of Arizona
Queens University
McGill University
University of Idaho
University of Illinois
Columbia University
University of North Dakota
Ohio State University
Oregon Agricultural College
Lehigh University
Carnegie Institute of Technology
South Dakota School of Mines
Texas School of Mines
University of Utah
Washington State College
University of Washington
Wisconsin Mining School

According to the Reviewers

According to the reviewers, Kraus and Holden's *Gems and Gem Materials* is a distinctive work.

The Jewelers' Circular says:

"The work is a valuable addition to the literature now extant on the subject of gems....The work has a real place in the literature of the industry and the thanks of the trade are due to Dr. Kraus and his late associate for their work in preparing the information in a way to make it understandable to the layman, as well as to the scientist."

The Engineering and Mining Journal-Press says:—

"The names of the authors are a guarantee of the accuracy and interest of this volume, which is beautifully presented."

Dr. C. Anderson of the Australian Museum writes:—

"It gives in comparatively small compass much valuable and interesting information on a fascinating subject, and reflects great credit both on the author and the publishers."

Professor B. Gossner of the Mineralogical Institute of the University of Munich writes:—

"A very noteworthy contribution."

A Medalist's Book

John Howe Hall was awarded the first Whiting Medal of the American Foundrymen's Association.

Major R. A. Bull in presenting the medal to Mr. Hall at the Convention Banquet of the American Foundrymen's Association, said:

"By far the most valuable contribution made by Mr. Hall to others in the steel casting industry is his book entitled *The Steel Foundry*, first published ten years ago, and issued in a second edition in 1921. This book is, without doubt, the most valuable guide to better steel foundry practice that has ever been printed in the English language."

We are indeed proud to be the publishers of a book that has won such praise.

Brief Reminders

We have just published Kneeland's *Preliminaries of Coal Mining*, the first of a three-volume series on Practical Coal Production. This first volume covers prospecting, explosives, development, drainage and ventilation.

* * * * *

Thirty-one colleges are using Stoughton's *Metallurgy of Iron and Steel* this year.

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Some recent McGraw-Hill books in the geological field are

Dake and Brown's *Interpretation of Topographic and Geologic Maps*
Willis's *Geologic Structures*
Spurr's *The Ore Magmas*

* * * * *

Have you read the nine conclusions of the discussion of the Amorphous Metal Hypothesis in Jeffries and Archer's *Science of Metals*?

What Should a Text Contain?

Lately we received a mighty interesting letter from a professor of mechanical engineering in a Western college expressing the wish that we might produce a condensed edition of French's *Engineering Drawing*, leaving out the material which he cannot use in his classes.

We pointed out that a condensed edition of *French* could hardly be sold for much less than the present edition.

When we queried Professor French in the matter, he said:—

"In the summary of returns from the request for criticisms sent out before the last revision, if everything marked 'not needed' had been omitted, nothing would have been left except part of the sixth chapter. If everything proposed for inclusion had been added, the book would have had 900 pages. Yet everyone of these proposals to add or subtract was sincere and meant to be helpful. The simple fact of the matter is that teachers differ as to the relative value of various topics, and that is a healthy condition and as it should be."

Bibliography on Machine Design

Leutwiler—*Elements of Machine Design*
Leutwiler—*Problems in Machine Design*
Smith—*Engineering Kinematics*
Heck—*Mechanics of Machinery: Mechanism*
Heck—*Mechanics of Machinery: Kinematics and Dynamics*
Mease and Nordenholt—*Design of Machine Elements*
Angus—*Theory of Machines*
Keown—*Mechanism*
Halsey—*Handbook For Machine Designers, Shop Men and Draftsmen*
Hills—*Machine Drawing*
Marshall—*Elementary Machine Drawing and Design*
Klein—*Kinematics of Machinery*
Colvin—*Machine Shop Drawing*

Seven Points About Weick

The new second edition of Weick and Panuska's *Elementary Mechanical Drawing* teaches mechanical drawing from a practical viewpoint through problems which are based on well-worked-out examples.

Seven special points about the book are:—

1. Notes and Sequence Rules to serve as a guide for a suitable order of procedure.
2. Problems in Wood or Metal—projects are given alternately—one for construction in wood and one in metal.
3. Layout Drawings given in connection with each example to illustrate a method of procedure to attain good composition.
4. A graded series of Problems with each example.
5. Optional Practice Problems showing how mathematics may be combined with mechanical drawing.
6. A Chapter on the mensuration of angles, plane figures and solids, giving definitions, formulas and worked-out examples, showing how formulas are used.
7. A Chapter on Sketching which presents an abundance of material in the form of exercises of a wide variety, providing the needed drill in visualizing and the arrangement of views.

Just a Line or Two

For methods of making charts, we recommend Riggleman's *Graphic Methods for Presenting Business Statistics.*

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In connection with charts, please keep in mind also Hewes and Seward's *Design of Diagrams for Engineering Formulas.*

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The draftsmen's reference shelf should have a copy of Bishop's *Electrical Drafting and Design.*

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A widely-used University of Wisconsin Extension Text is Blair's *Principles and Practice of Show-Card Writing.*

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Suggestions for courses in lettering should include

French and Meiklejohn's *Essentials of Lettering*

French and Turnbull's *Lessons in Lettering: Book I and Book II.*

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The material on cams in Smith's *Engineering Kinematics* is especially interesting.

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The practical character of the problems in Smith's *Practical Descriptive Geometry* appeals to a great many teachers.

From Field's *Architectural Drawing.*

A Suggestion for Engineering Problem Courses

The new second edition of Duckering's *Notes and Problems for Engineering Problem Courses* is in use at Iowa State College as in many other colleges where the problem course is given. We were interested to note from a recent letter from Professor F. C. Dana who gives the course at Iowa State College that McClure's *How to Think In Business* is also of value in such courses.

Professor Dana says:—

"Another book of yours to which I refer my students and from which I frequently quote is McClure's *How To Think in Business.* Few books state the aims we have in Problems Courses in as definite manner as does this one."

First Aid to Authors

A new printing of *Suggestions to McGraw-Hill Authors* is now available. This booklet discusses the principal points in preparing manuscript for publication. A copy will be sent without charge to any teacher upon request.

Last Minute Notes

Just as we are going to press with this issue of McGraw-Hill Book Notes, we learn that Croft's *Signal Wiring* will be published early in February.

* * * * *

Bryant and Correll's *Alternating-Current Circuits* has just been adopted at Yale University and at the University of Illinois.

* * * * *

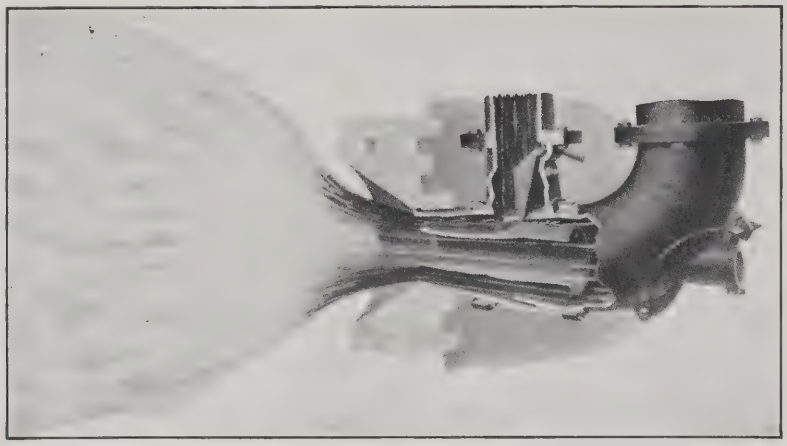
Here is a letter we have just received:—

"The College Extension Division of this institution has just completed a correspondence course on steam power plant practice and we have decided to use as a reference book for this course Potter and Calderwood's *Elements of Steam and Gas Power Engineering.*

"Frank Capps,
Director, College Extension Division
North Carolina State College,
Raleigh, N. Car."

* * * * *

The University of Amoy, China, has just adopted Blanchard's *Essentials of Advertising*, ordering 20 copies.



Rayco powdered coal burner. From Haslam and Russell's *Fuels and Their Combustion*.

Fuel Utilization and Combustion

The work carried on at the Massachusetts Institute of Technology in the field of combustion engineering is attracting wide attention. Out of this work has grown Haslam and Russell's *Fuels and Their Combustion*.

This book summarizes the latest investigations and describes the important new developments in the economic utilization of fuels. It covers the whole subject broadly and points out the underlying principles on which further progress must be based.

It takes up actual plant practice and shows what are the best methods for specific purposes.

It gives a thorough treatment of the origin, composition and production of fuels.

It presents the underlying principles of the science of combustion.

It describes typical combustion equipment.

It explains common combustion reactions.

It discusses the flow of air and flue gases and heat transfer.

Hundreds of special topics of great importance today are covered, among them:—

—the fuel situation today;
—effects of weathering on coal;
—colloidal fuel;
—chemistry of combustion reactions;
—combustion calculations;
—advantages of gaseous fuels;
—effect of air velocity on combustion;
—best methods of operating hand-fired furnaces;
—best methods of handling mechanical stokers;
—advantages and disadvantages of powdered fuel;
—best methods of using fuel oil;
—how to secure maximum furnace efficiency;
—how to secure efficient producer gas operation;
—applications and uses of water gas and oil gas;
—the carbonization of coal;
—rate of heating.

Several of the chapters in this book would by themselves make important volumes.

The Chemistry Bookshelf

One reviewer said lately:

> "The International Chemical Series, edited by Professor H. P. Talbot, reaches in Eucken, Jette and LaMer's *Fundamentals of Physical Chemistry* its thirty-ninth volume. This valuable series is attaining genuinely encyclopedic dimensions and is practically indispensable in any well-equipped chemical library."

The blushes are ours!

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Coming soon—

Lewis and Radasch's *Industrial Stoichiometry*

Underwood's *Problems in Organic Chemistry*

Koehler and Thelen's *Kiln Drying of Lumber*

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In the October issue of McGraw-Hill Book Notes we reported that Adkins and McElvain's *Introduction to the Practice of Organic Chemistry in the Laboratory* had been adopted in 22 colleges. The list has now grown to 27 colleges.

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For courses in quantitative analysis we recommend Mahin's *Quantitative Analysis*.

* * * * *

Walker, Lewis and McAdams' *Principles of Chemical Engineering* is now in its fourth printing.

* * * * *

Here is a paragraph from another review of Eucken, Jette and LaMer's *Fundamentals of Physical Chemistry*:

> "Glancing over the authorities cited it is interesting to note the frequency of the name of Professor Einstein. Few are aware of the extent to which physical chemistry is indebted to the originator of the concept of 'relativity'."

International Critical Tables

The National Academy of Science and the National Research Council have undertaken in *International Critical Tables of Numerical Data of Physics, Chemistry and Technology*, the greatest technical publishing venture ever attempted in this country.

The work of compiling the *Tables* was undertaken by the National Research Council at the request of the International Union of Pure and Applied Chemistry, with the endorsement of the International Union of Pure and Applied Physics, and under the auspices of the International Research Council. Dr. Edward W. Washburn is Editor-in-Chief.

The material contained in *International Critical Tables* has been collected and critically evaluated by some 300 Co-operating Experts, including chemists, physicists, and engineers of the United States, Canada, Great Britain, Belgium, France, Italy, Austria, Germany, Denmark, Switzerland, Holland, Australia and Japan.

The editorial expenses (about $170,000) have been contributed by American industrial firms and Benevolent Foundations. The work of the Co-operating Experts, which is practically gratuitous, may be assigned a money equivalent of not less than $300,000. The cost of printing and distribution will be about $100,000 and the whole undertaking represents a money value of at least $570,000, of which the returns from subscriptions will represent only a minor part.

The *Tables* will be published in five volumes, the first of which is now on press. The National Research Council is making a special pre-publication price offer (see back cover of this issue of Book Notes for details).

That we have been chosen by the National Research Council to publish the *Tables* is most gratifying.

The Audience for Lewis and Randall

Four printings have been necessary to date to care for the demand for Lewis and Randall's *Thermodynamics and the Free Energy of Chemical Substances*.

Left—R. T. HASLAM, Professor of Chemical Engineering; In charge of Course in Gas and Fuel Engineering, Massachusetts Institute of Technology.

Right—R. P. RUSSELL, Assistant Professor of Chemical Engineering; Assistant Director, Research Laboratory of Applied Chemistry, Massachusetts Institute of Technology.

The field of the book is best expressed in the words of the authors themselves in their preface:

"There are several kinds of audience to which a book on thermodynamics might be addressed. There is the beginner who, in order that he may decide whether the subject will meet his needs or arouse his interest, asks what thermodynamics is and what sorts of problems in physics, chemistry and engineering can be solved by its aid; there is the reader who looks for the philosophical implications of such concepts as energy and entropy; above all there is the investigator who, attacking problems of pure or applied science, seeks the specific thermodynamic methods which are applicable to his problem and the data requisite for its solution.

"Perhaps we have been over-ambitious in attempting, within the confines of a single volume, to meet all these demands, —to lead the beginner through the intricacies of thermodynamic theory and to guide the experienced investigator to the extreme limits now set by existing methods and data."

An Englishman Looks at Thomas

The Bulletin of the Imperial Institute (London) says about Thomas's *Bacteriology: A Textbook on Fundamentals*:—

"This volume is written to meet the need for a textbook treating of the fundamentals of bacteriology and suitable for use in teaching elementary bacteriology to mixed classes of engineering, chemical and medical students. An introductory chapter is devoted to a consideration of the general conception of life and life's processes. Chapters follow on the history, classification, morphology and physiology of bacteria. The bacteria occurring in water are considered and a rough outline is given of the various methods employed on a large scale for the purification of water for town supply purposes. The bacteriology of sewage and the elimination of bacteria in connection with sewage disposal are dealt with, and a description is given of the bacteria in the soil and the bacterial processes occurring there. A section on bacteria in foods includes studies of organisms which are used in their preparation; on those which cause spoilage of food products, and on pathogenic organisms which are transmissible through food. Other sections are concerned with pathogenic bacteria, immunity, hygiene and sanitation. The last chapter, entitled "Bacteria in Industry," gives a very short account of those industries in which bacteria play a part, such as the production of alcohol, acetic acid, lactic acid, butyl alcohol and acetone; leather manufacture; the rotting of fibres; and the tea and tobacco industries.

STANLEY THOMAS
Associate Professor of Bacteriology, Lehigh University.

"The work is well written and should fulfil the purpose for which it was intended."

Modern Physical Chemistry

Says Professor Taylor of Princeton University in a review of Eucken, Jette and LaMer's *Fundamentals of Physical Chemistry* in Chemical and Metallurgical Engineering:—

"Anyone who wishes for a fresh, original, and, in most respects, up-to-date treatment of modern physical chemistry in its fundamental aspects can find it in this book, well printed, well published, at a reasonable price."

The book has already been adopted in the following colleges:—

University of Chicago
Johns Hopkins University
George Washington University
University of Rochester
University of Utah
Columbia University

True Talk By McGraw-Hill Authors

"Had Darwin known of the pea hybrids, it is probable that the whole course of evolutionary theory would have been different. As it was, Mendel's paper remained unnoticed for a third of a century."

—Shull's *Heredity*

* * * * *

"The element of time saving in transportation has a large economic importance. Today the airplane is the fastest means of transportation. * * * The United States leads the world in railway and motor transportation. It will undoubtedly make rapid progress in the commercial uses of airplanes."

—Herbert Hoover in *Civil Aviation*

* * * * *

"As a result of a study of business cycles a foreman will profit in two ways: In the first place, he will have a new and different understanding of the great problems of industrial management which grow out of business cycles; and in the second place, it will place him in a position to combat false ideas among the rank and file and thus promote the mutual interest of the men and the management."

—Gardiner's *Management in the Factory*

* * * * *

"That the use of mathematical formulas in the teaching of physical chemistry, with the appropriate adjustment on the part of the teacher, can be performed successfully is shown by the results in analogous subjects—for example, in engineering—for there is no doubt that the students of this subject can actually attain the mathematical preparation essential to it. Should not this be possible for the majority of students of chemistry also?"

—Eucken, Jette & LaMer's *Fundamentals of Physical Chemistry*

* * * * *

"Studying a mathematical textbook involves much more than the mere reading of the statements of principles and of the explanation of processes. The student must usually read the assigned paragraphs several times and must frequently turn back and re-read portions of the text included in previous lessons. In this manner the various points in the reasoning or explanations can be thought over, and the habit of asking self-put questions about the work can be acquired.

"First of all, in preparing a lesson, try to find out what it is about—what its purpose is. Try to decide how you yourself would go about the accomplishment of the task and, if possible, make an independent attempt of your own. The more consideration you give to such an attempt, the greater scientific power you will gain."

—Slichter's *Elementary Mathematical Analysis*

Do We Need Better Engineering Education?

(*Continued from page 4*)

preparation has been judged as good in relation to the requirements of practice. All but one seventh of the graduates have rated the cultural content in the range from justified to indispensable. More than half identify economic and business subjects as the most important omissions, while more than a quarter designate English under this head.

In their recommendations for improvement, one sixth of the graduates put more business training first, another sixth more practical training, another sixth suggest the lengthening of all courses, while another sixth ask for more and better cultural work. One eighth suggest less specialization and one sixteenth more or better teaching of the sciences. Less than 2 per cent suggest more or better teachers as the most needed improvement.

Judged by the prevailing state of collegiate education in general, the engineering colleges are in a good state of health. If they are content to remain on this prevailing level, only incidental improvements may be expected or are needed to maintain their present relative position. Notable advancement will be possible only by pioneering in organization and method aiming at advanced ground in the realm of undergraduate education. Such an ambition seems both worth while and attainable.

For the Shelf Marked 'Mathematics'

A second edition of *Six-Place Tables is* ready. The revision includes additional tables and explanatory notes on the use of the tables.

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Here are nine special points about *Mathematics of Finance* by Professor Lloyd L. Smail of the University of Texas:—

1. Alternative proofs for most of the important formulas.
2. Solutions of problems by long arithmetic methods, by interest tables and by logarithms.
3. Full and careful treatment of equation of payments.
4. Large numbers of exercises arranged so that every pair of problems, odd and even, 1-2, 3-4, are of same character. Answers given for odd numbered problems only.
5. At the end of each chapter a review set of problems is given, covering all topics up to that point.
6. Special three-chapter discussion of compound interest, present value and compound discount.
7. Special four-chapter discussion of annuities.
8. At the end of the book, carefully classified summary of all formulas of the subject.
9. Much new material of a theoretical nature, printed in small type.

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Our recent books on statistics include
Gavett's *A First Course in Statistical Methods*
Sutcliffe's *Elementary Statistical Methods*

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For courses in analytic geometry, please keep in mind Palmer and Krathwohl's *Analytic Geometry*.

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Have you looked up as yet the new exercises and new material in the new third edition of Slichter's *Elementary Mathematical Analysis*?

The Latest in Radio

The developments in radio have been so rapid that a new edition of Moyer and Wostrel's *Practical Radio, Including the Testing of Radio Receiving Sets* has become necessary. This new edition is now ready.

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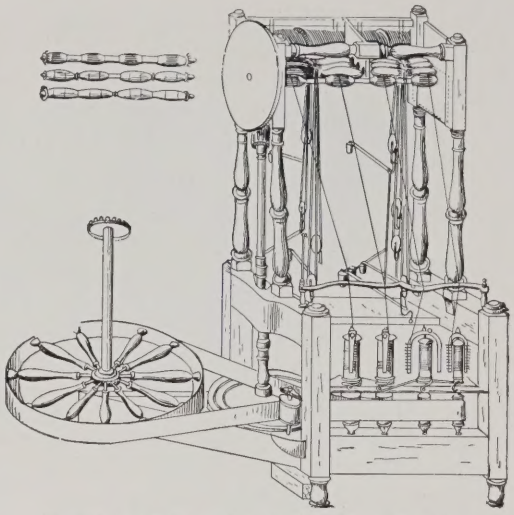

Sir Richard Arkwright's Spinning Machine
Patented 1769. From Kimball's *Principles of Industrial Organization.*

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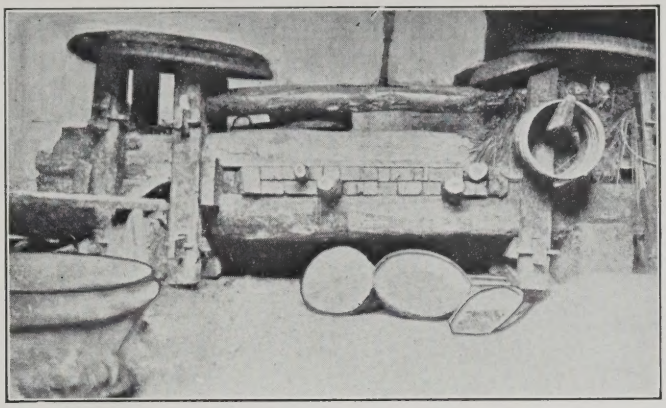

Wedge press used for extracting Chinese wood oil. From Leighou's *Chemistry of Engineering Materials.*

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